

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/DE2004/001294

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H01L21/336

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages           | Relevant to claim No.  |
|------------|--|------------------------|
| T          | US 2001/038103 A1 (NITTA KOICHI ET AL)<br>8 November 2001 (2001-11-08)<br>the whole document | 1, 3, 4,<br>10, 11, 17 |
| A          | US 2002/094643 A1 (GUARINI KATHRYN W ET AL) 18 July 2002 (2002-07-18)<br>abstract            | 1                      |
| T          | US 3 849 204 A (FOWLER A)<br>19 November 1974 (1974-11-19)<br>the whole document             | 1, 4, 5,<br>12, 17     |

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

28 October 2004

Date of mailing of the international search report

09/11/2004

Name and mailing address of the ISA

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### Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.: 1-21 because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

### SEE SUPPLEMENTAL SHEET PCT/ISA/210

3.  Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

#### Remark on Protest

The additional search fees were accompanied by the applicant's protest.  
 No protest accompanied the payment of additional search fees.

Continuation of Box II.2

## Claims 1-21

Claim 1 is vague. The phrase "establishing a contact" is confusing on account of the term "dielectric" in claim 4, which indicates that the connection is not electrical as specified in (for example) the IPC classification H01L21/768. Claim 1 also lacks clarity and conciseness because the word "or" is used four times, because the term "passivating elements" is vague, and because there is not enough support in the description to determine which documents are prejudicial to novelty.

- US 3 849 204 (document D1) could be prejudicial to the novelty of claim 1, with silicon substrate 1 as the first layer and dielectric 2 as the adjacent layer. Hydrogen is implanted in the first layer as a passivating element (passivating according to page 2, lines 20 to 25 of the application) and a heat treatment is carried out in which the interface is passivated by the hydrogen (figure 1C), which is easier if the hydrogen is enriched at the interface. The application does not give any values for hydrogen as a passivating element (despite the requirement of PCT Article 5); therefore, if there is no enrichment in D1, claim 1 would claim only a desired result without specifying how it is supposed to be achieved.
- US 2001/038103 A1 (document D2) (see figures 5 to 7) could be prejudicial to the novelty of claim 1, with contact layer 16 as the adjacent layer (a semiconductor layer, as in claim 4) and electrode layer 34' as the first layer (a metal, as in claim 3). In D2 an element such as sulphur, selenium or tellurium (chalcogens, as in claim 11) is implanted (paragraph 99) and then removed from the electrode layer by heat treatment (paragraph 108), which undoubtedly increases the concentration at the interface. Otherwise claim 1 would relate to a desired result without specifying how it is supposed to be achieved. However, the application does support chalcogen enrichment at the interface with a silicide (claim 2 in conjunction with claims 10 and 11).

Since it cannot be determined whether these documents are relevant or whether there is a lack of unity of invention with claim 2, it is not possible to carry out a meaningful search.

The applicant is advised that claims relating to inventions in respect of which no international search report has been established cannot normally be the subject of an international preliminary examination (PCT Rule 66.1(e)). In its capacity as International Preliminary Examining Authority the EPO generally will not carry out a preliminary examination for subject matter that has not been searched. This also applies to cases where the claims were amended after receipt of the international search report (PCT Article 19) or where the applicant submits new claims in the course of the procedure under PCT Chapter II. However, after entry into the regional phase before the EPO an additional search may be carried out in the course of the examination (cf. EPO Guidelines, Part C, VI, 8.5) if the deficiencies that led to the declaration under PCT Article 17(2) have been corrected.

**INTERNATIONAL SEARCH REPORT****Information on patent family members**

International Application No

PCT/DE2004/001294

| Patent document cited in search report |    | Publication date |                                  | Patent family member(s)   |  | Publication date   |
|--|----|------------------|----------------------------------|---|--|--|
| US 2001038103                          | A1 | 08-11-2001       | JP<br>US                         | 10247747 A<br>6281526 B1  |  | 14-09-1998<br>28-08-2001   |
| US 2002094643                          | A1 | 18-07-2002       | US                               | 2003132492 A1   |  | 17-07-2003   |
| US 3849204                             | A  | 19-11-1974       | CA<br>DE<br>GB<br>JP<br>JP<br>JP | 994924 A1<br>2422195 A1<br>1454237 A<br>1000610 C<br>51006679 A<br>54033917 B |  | 10-08-1976<br>16-01-1975<br>03-11-1976<br>30-05-1980<br>20-01-1976<br>23-10-1979 |